Enlistment Early Warning System Study

Briefing to the Army Accessions Research Consortium

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Cost Analysis & Research Division

IDA

Executive Summary

- DOD responds too slowly to changes in the economy
  - Leads to accession crises and waste
  - *Need Crisis Prevention Management*
- Created credible, accurate and timely Enlistment Early Warning System (EEWS) for each Service
- Annual forecasting error for high quality enlistments is 1-3 % for each Service
- Implement *Crisis Prevention Management*
  - Run the EEWS
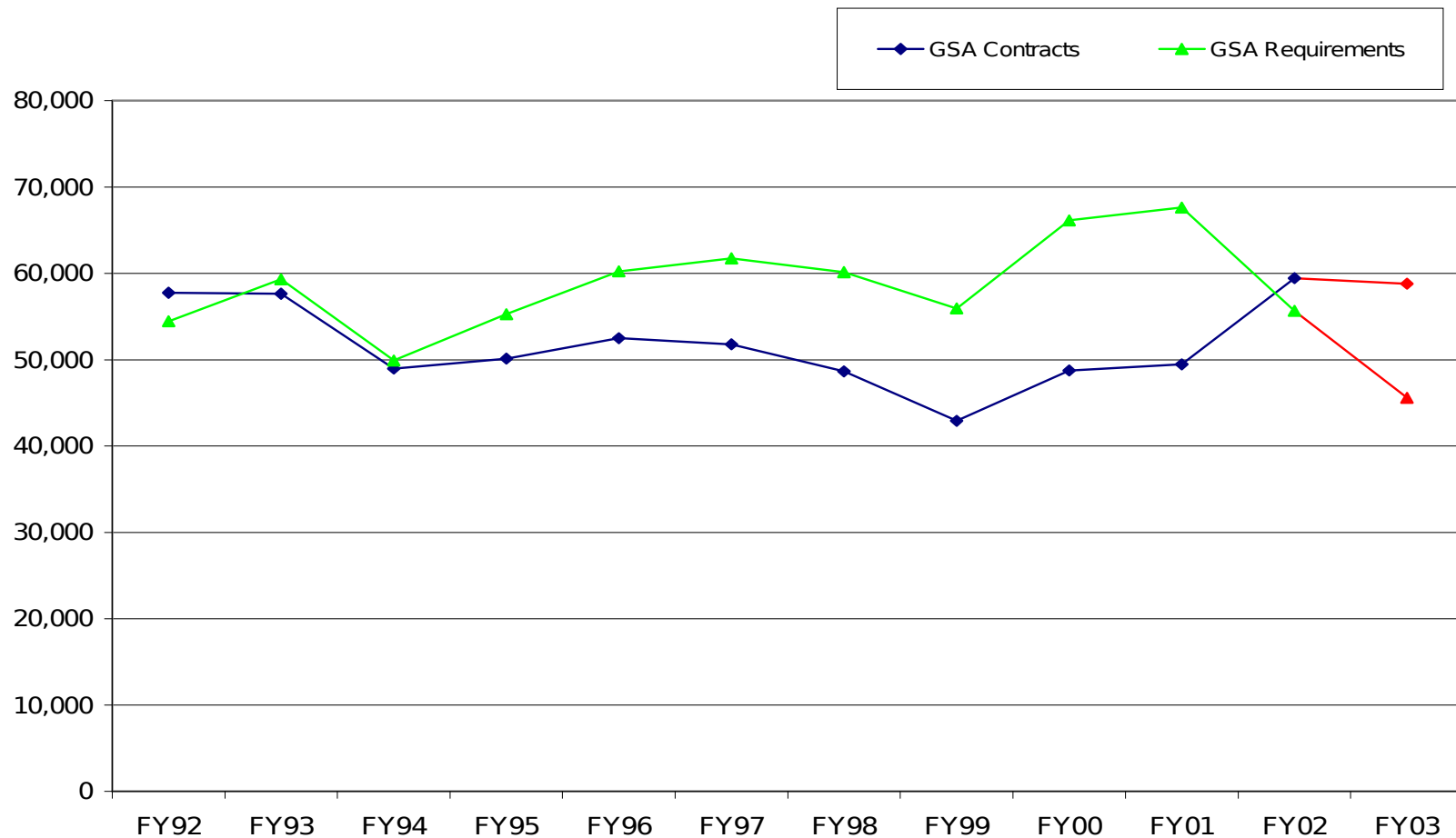 - Adjust recruiting resources more quickly

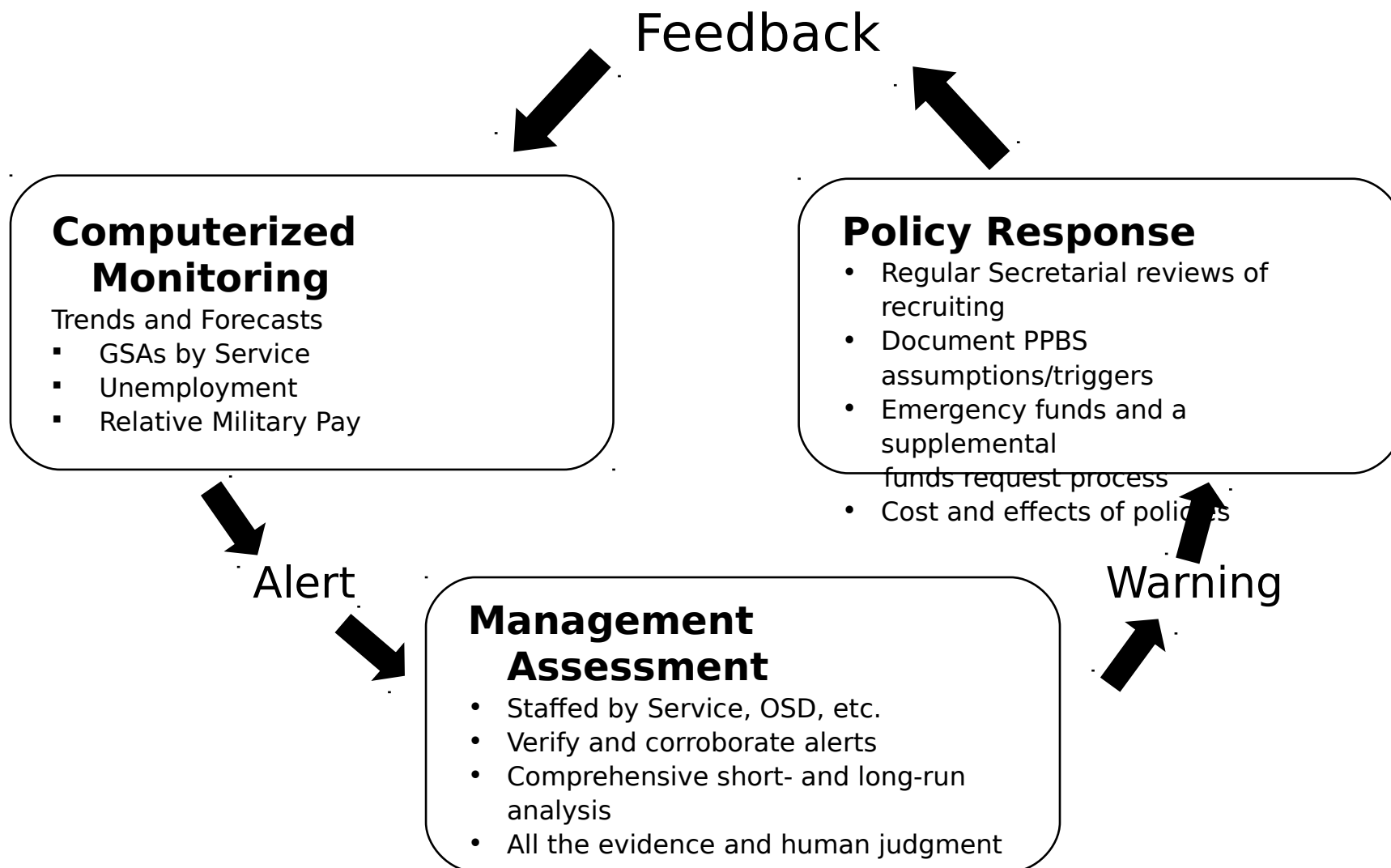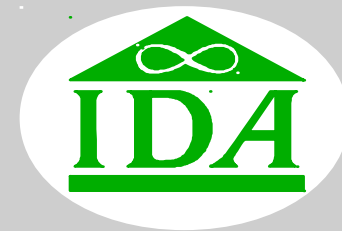**Quantity and Quality of Army Accessions**

Cost Analysis & Research Division

Legend: Total Accessions | % NPS HSDG | % NPS 1-3A HSDG | % NPS 1-3A
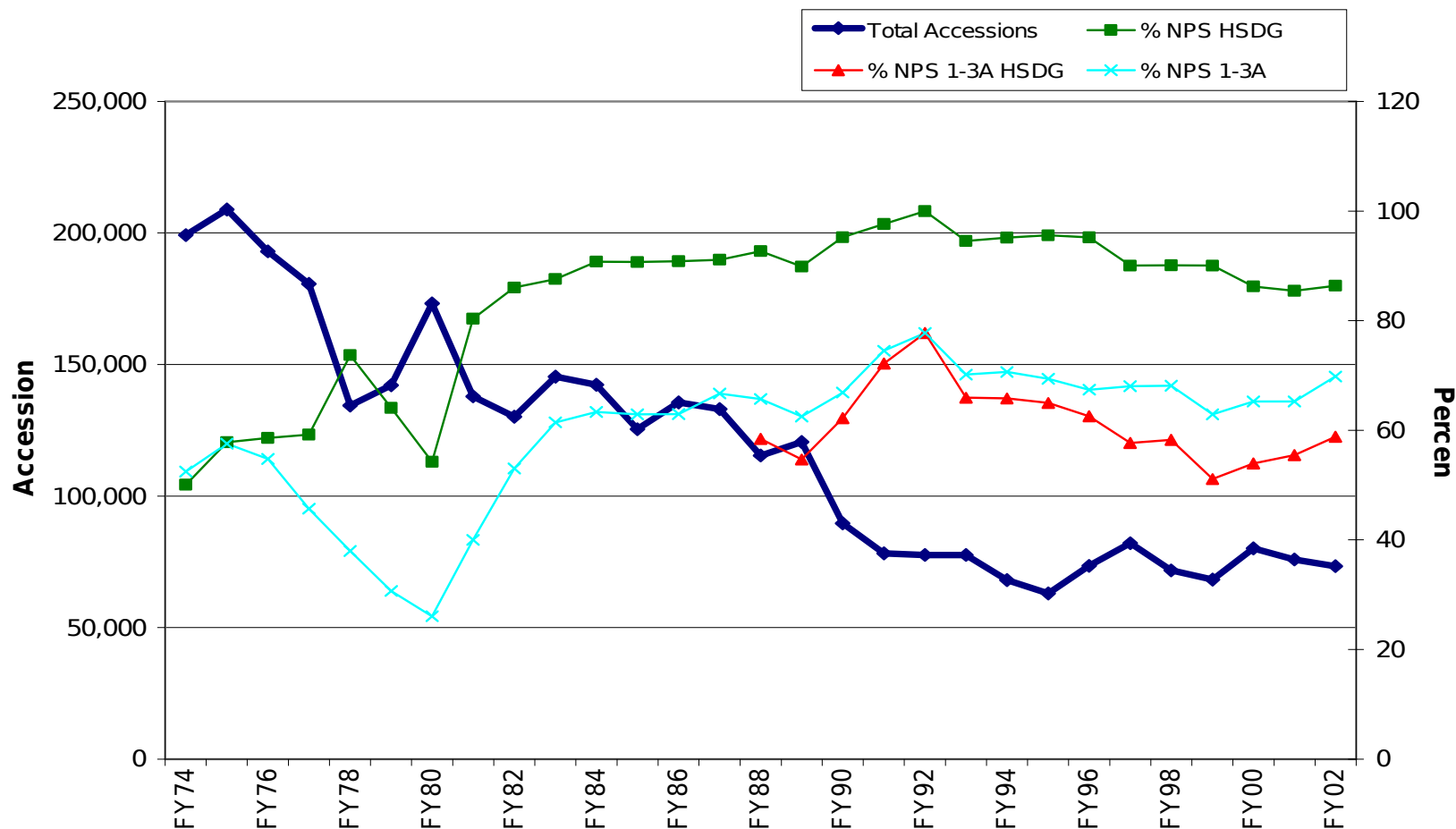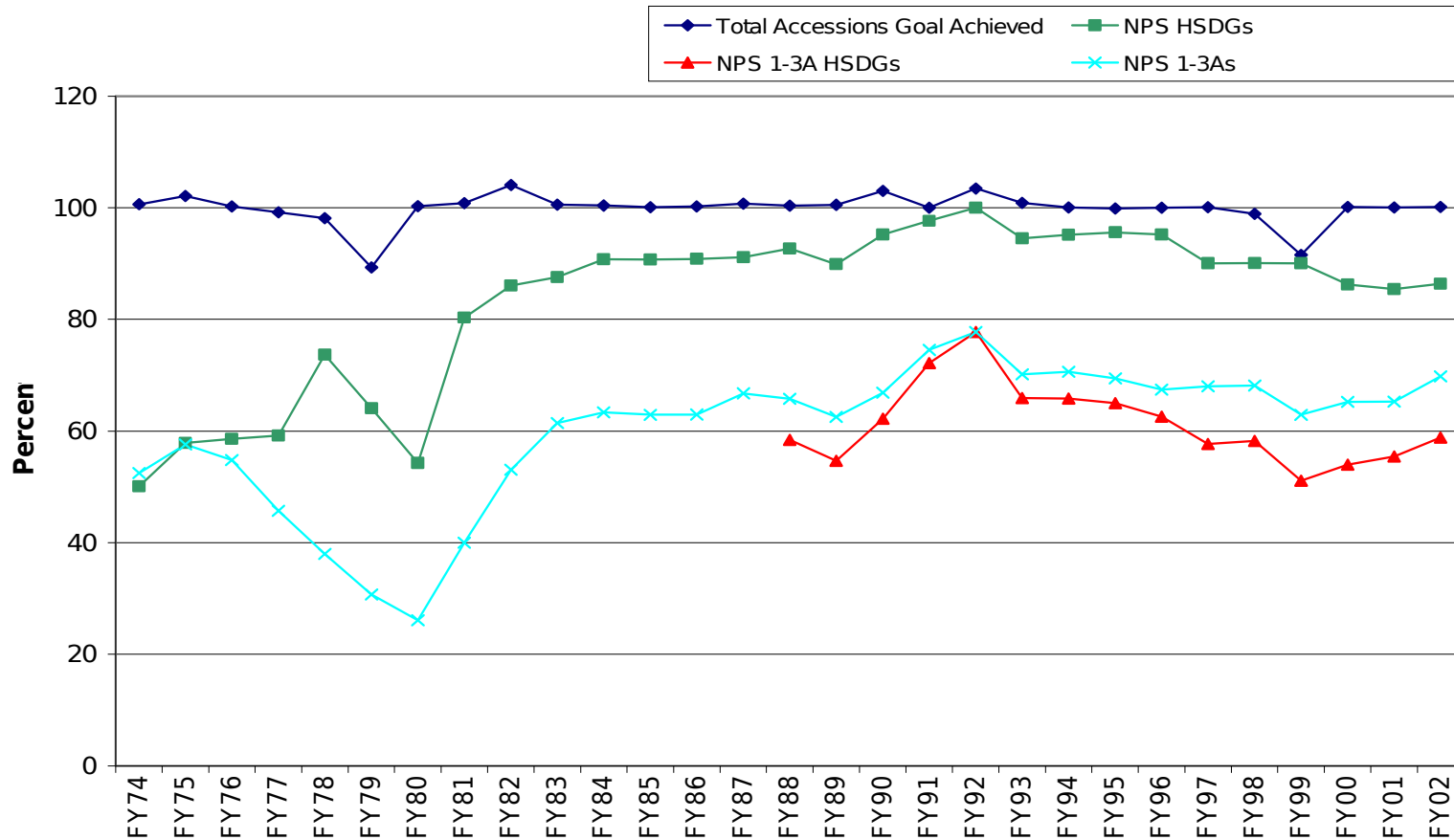
Graduate and Senior 1-3A (GSA) Enlistment Contracts and Requirements

Enlistment Crisis Prevention Management

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Feedback

Computerized Monitoring

Trends and Forecasts
- GSAs by Service
- Unemployment
- Relative Military Pay

Policy Response
- Regular Secretarial reviews of recruiting
- Document PPBS assumptions/triggers
- Emergency funds and a supplemental funds request process
- Cost and effects of policies

Alert

Management Assessment
- Staffed by Service, OSD, etc.
- Verify and corroborate alerts
- Comprehensive short- and long-run analysis
- All the evidence and human judgment

Warning

Army Enlistment Early Warning System

EEWS Report Risk Assessment:
• GSA Contract Mission

GSA Contracts CDF

Forecasts of GSMA, GSFA Contracts

Planned Levels, Bonuses, ACF, Advertising, Goals, Recruiters & MILPAY

Unemployment Forecasts

Civilian Earnings Forecasts

Forecasting & Simulation Models – GSMA, GSFA

Forecasting & Simulation Model – Unemployment

Forecasting & Simulation Models – Civilian Earnings

GSA Contracts & Supply Factors Data

Unemployment & Leading Economic Indicators Data

Civilian Earnings Unemployment, CPI Data

Army Enlistment Forecasting Models

- Log-linear specification
- Dependent variables
  - GSMA enlistments
  - GSFA enlistments
- Independent variables
  - Relative military pay
  - Unemployment
  - Expected education benefits/cost of college
  - Expected bonuses/CPI
  - Recruiters
  - Contract missions per recruiter
  - Advertising
  - Dummies for months (seasonality)
  - Moving average error terms
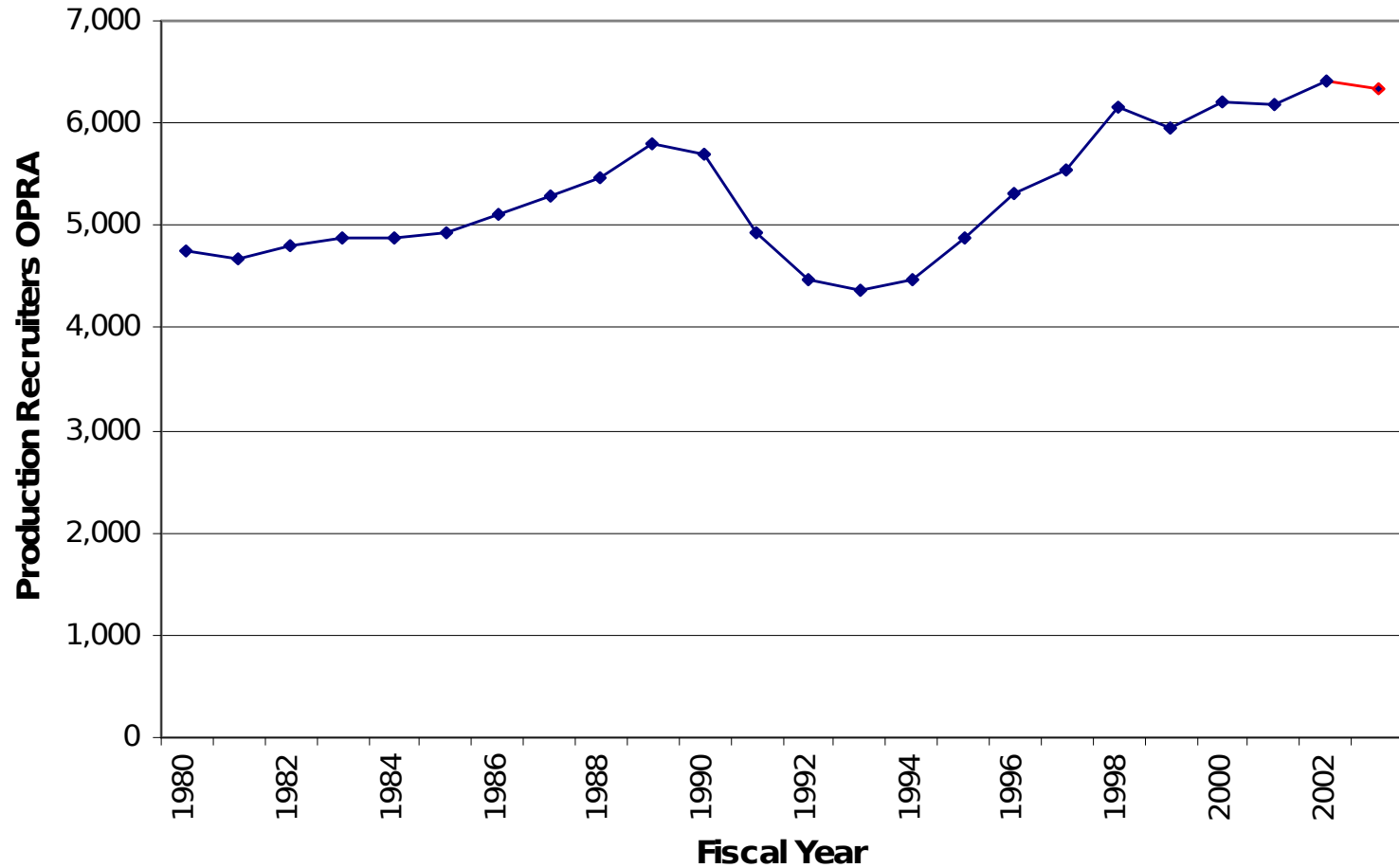- Estimated using "RATS" software
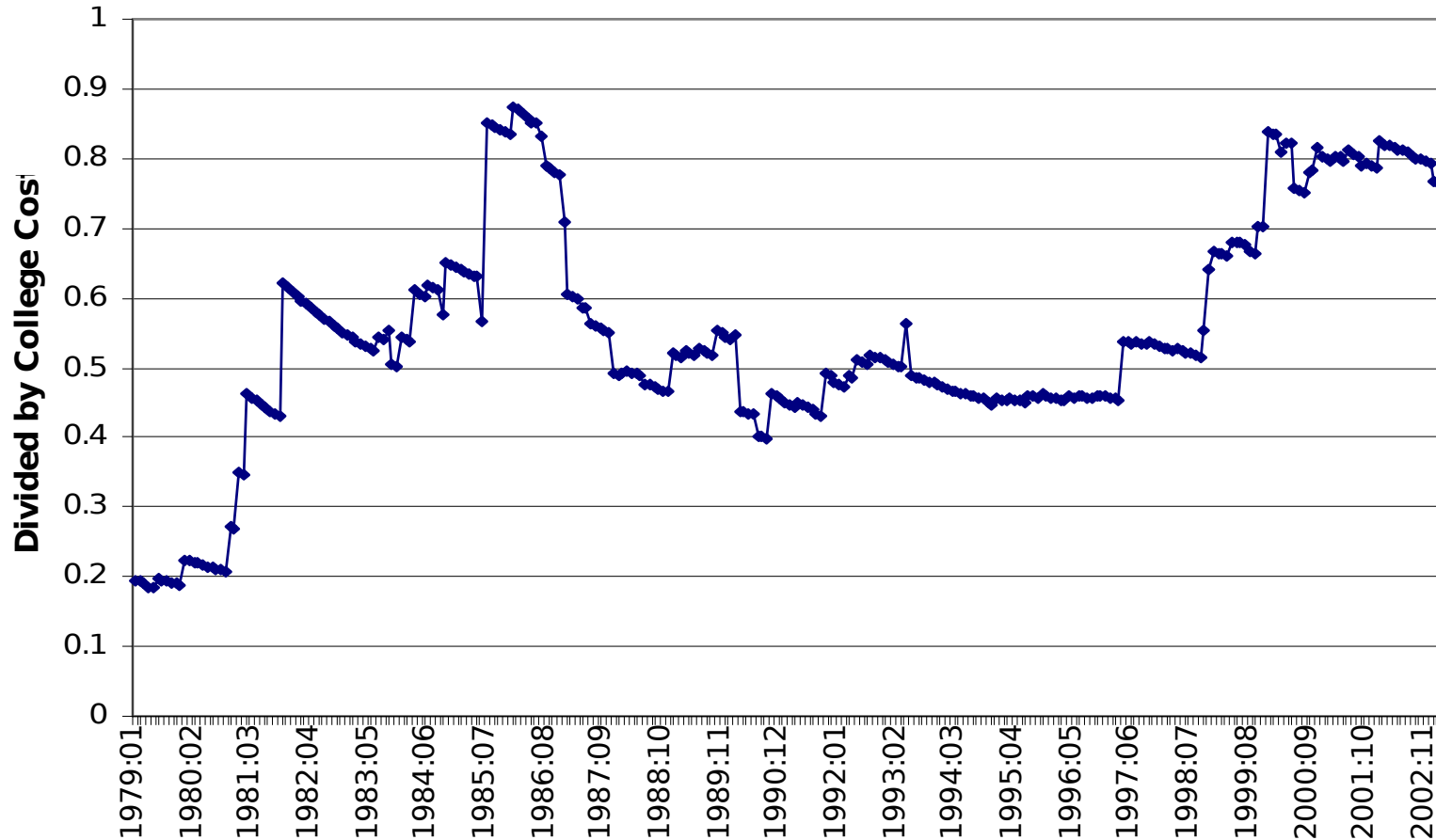
Ratio of Military to Civilian Pay
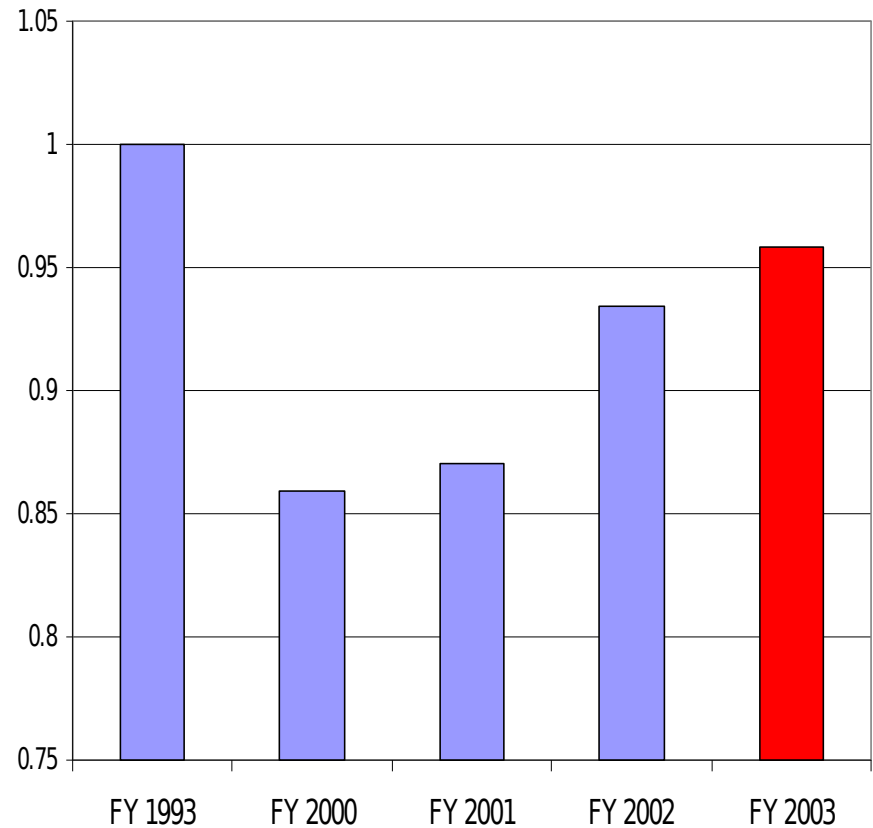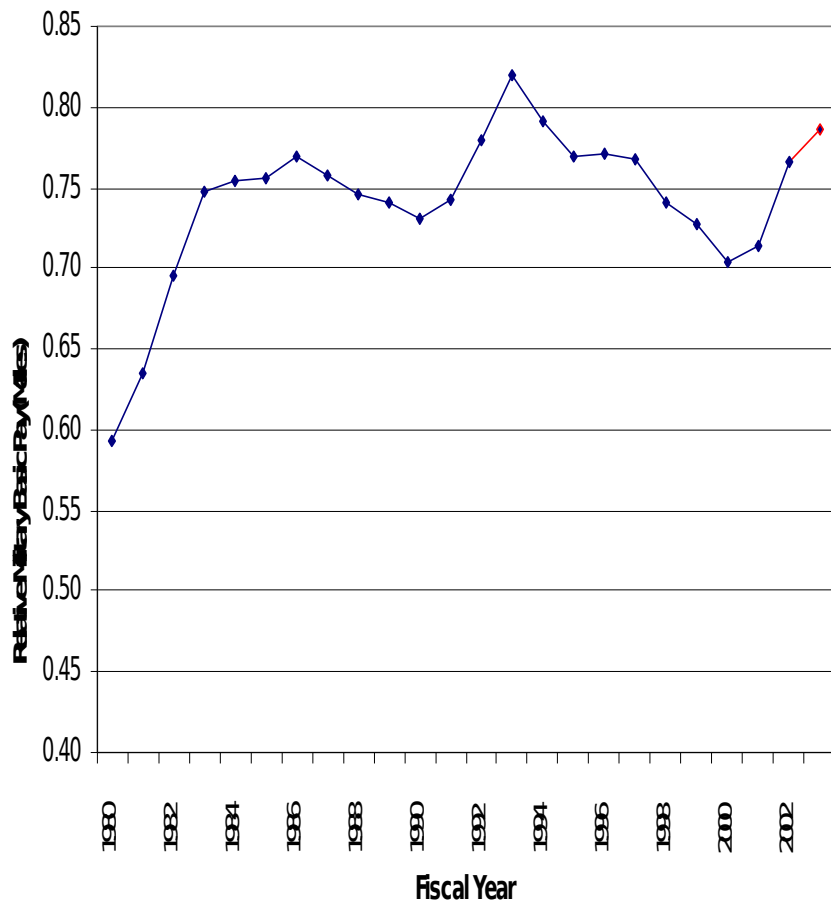
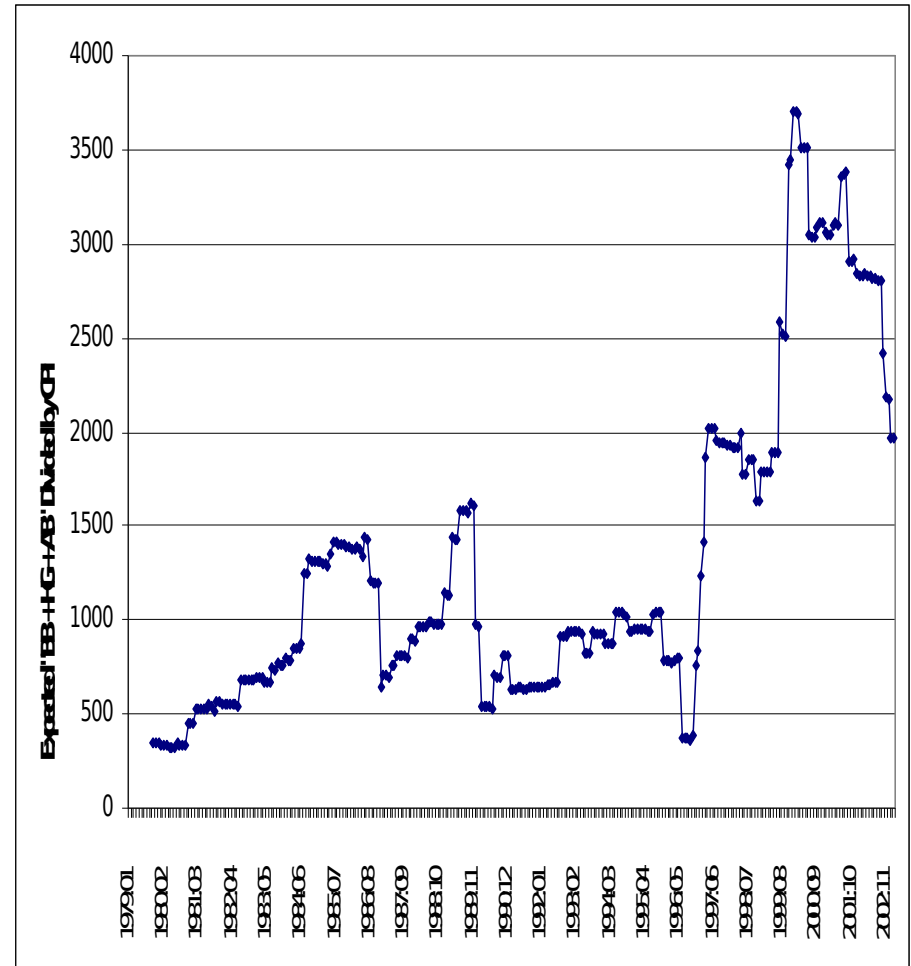# Unemployment Rate (Total Civilian)
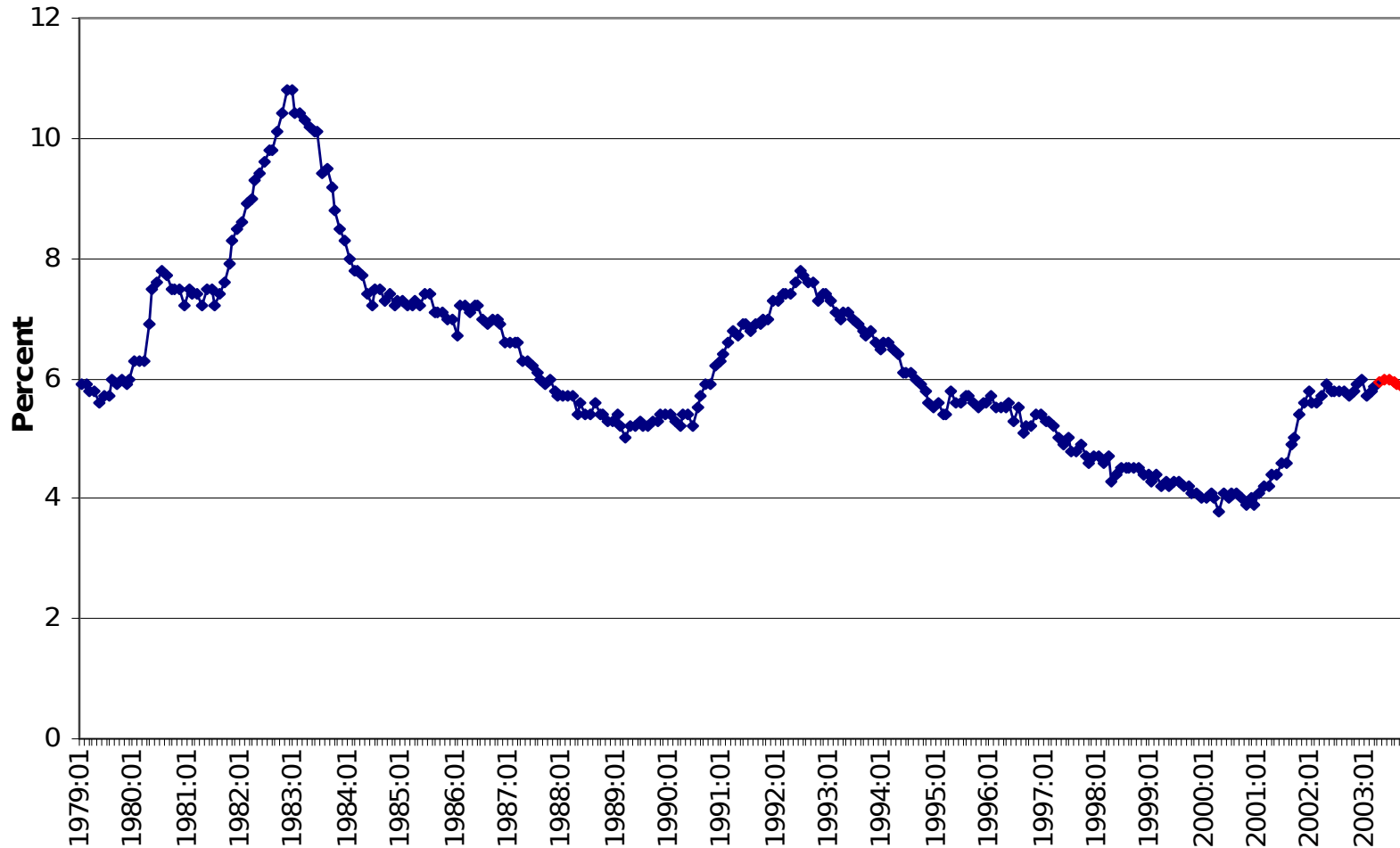
Army Recruiters

Army Education Benefits

Army Enlistment Bonuses
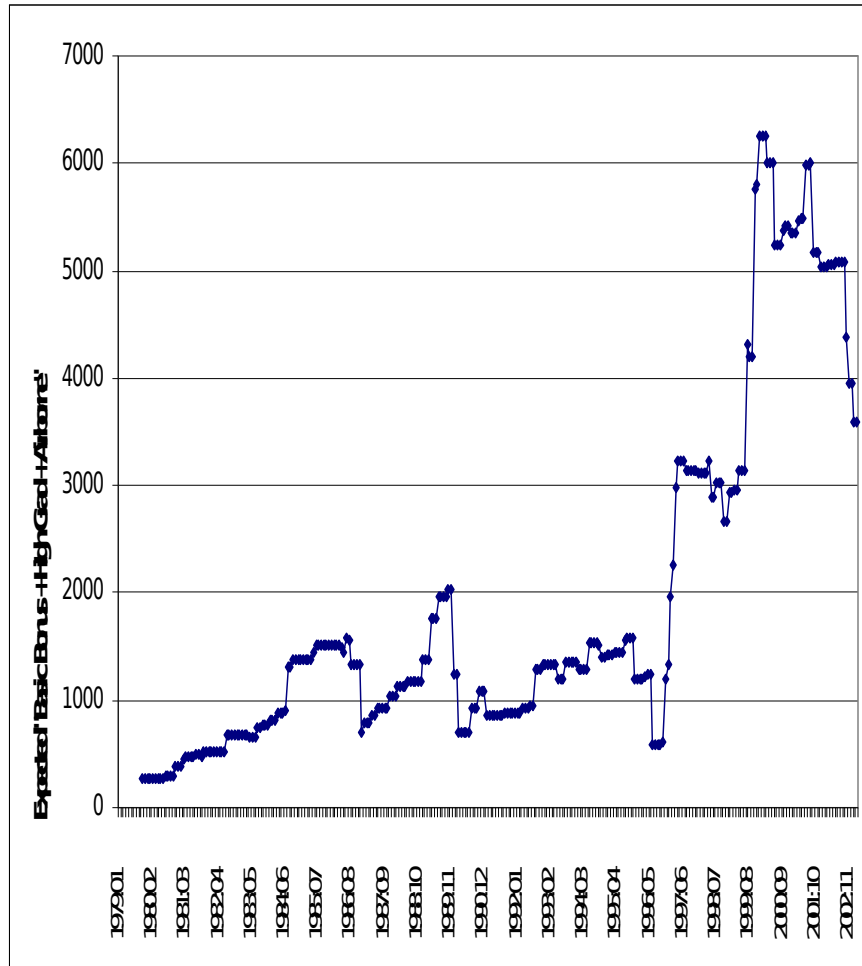
Army Advertising

- Monthly total media placement costs (1983 dollars)
  - Weighted average of last 6 months
  - Declining weights: 6/21, 5/21, …, 1/21
  - General market program ($TV + $Radio + $Print)

    plus other RA advertising ($minority + $special)
  - Adjusted for inflation using McKann-Erickson media cost indexes
- Data from US Army Recruiting Command and McKann-Erickson
- National monthly data: 01/81–12/89
- National quarterly data: 01/90–3/01

Army Advertising

6-Month Distributed Lag (Sum-of-Year Digits)
Base Year = 1983
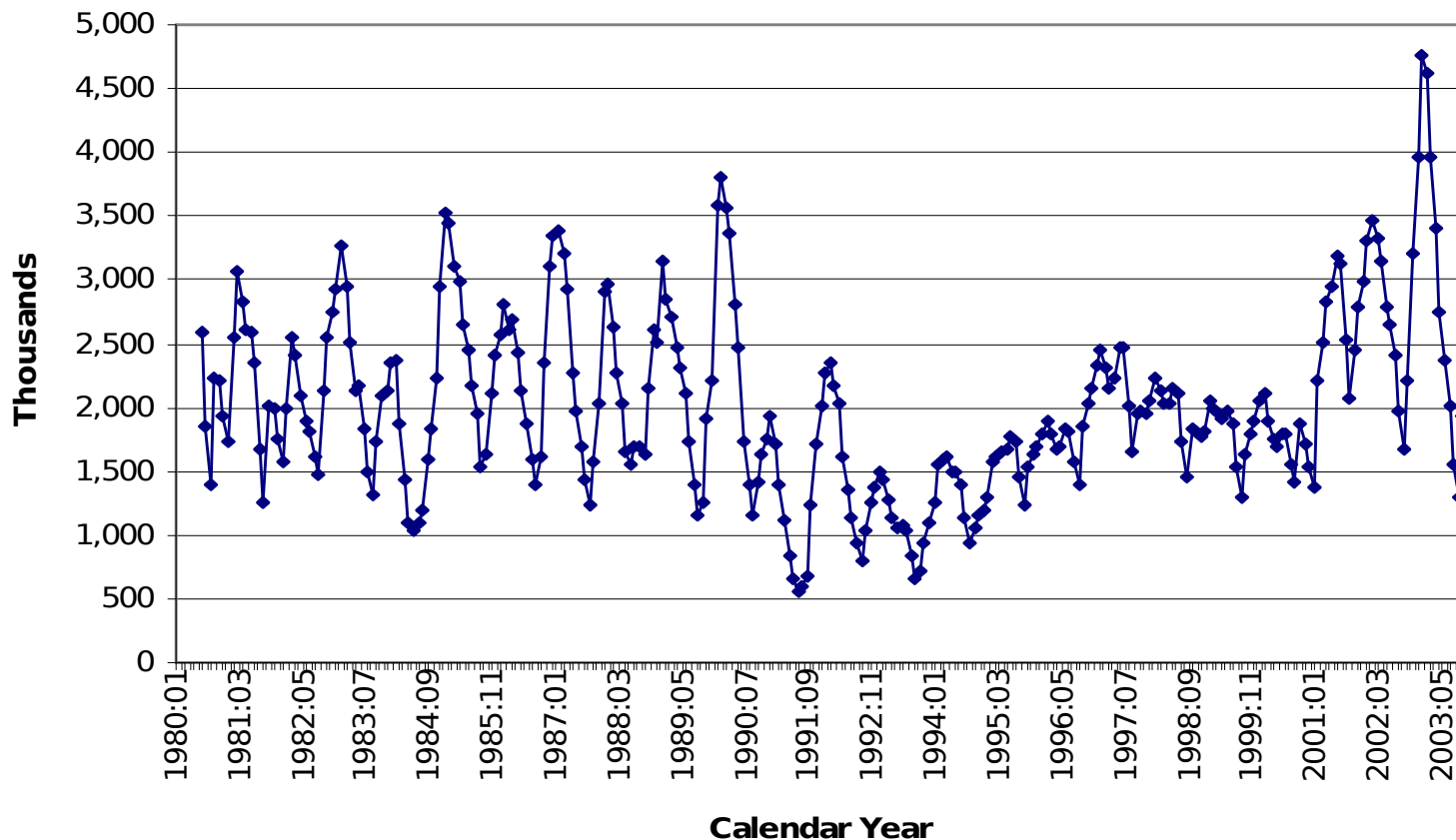
Army Model for Male GSA Contracts

Variable	Coefficient	Std Error	T-Stat
Constant	1.93	1.85	1.04
Relative Mil Pay	0.70	0.28	2.52
Unemployment	0.67	0.16	4.29
GSMA Goal	0.13	0.05	2.77
Other Goals	-0.05	0.06	-0.88
Recruiters	0.57	0.19	2.95
Bonus	0.03	0.03	1.33
ACF+MGIB	0.14	0.09	1.60
Adjusted R-squared	0.87		
No of Observation	102		
Period	Oct 1992 – Mar 2001		
Monthly dummies and moving average terms are not reported			

Army Model for Female GSA Contracts

Variable	Coefficient	Std Error	T-Stat
Constant	-0.58	2.35	-0.25
Relative Mil Pay	0.80	0.36	2.21
Unemployment	0.48	0.18	2.63
GSFA Goal	0.09	0.02	3.53
Recruiters	0.61	0.26	2.38
Advertising	0.20	0.07	2.84
Adjusted R-squared	0.77		
No of Observation	102		
Period	Oct 1992 – Mar 2001		
Monthly dummies and moving average terms are not reported			

Effect of the Economic Boom on Army Male GSA Contracts:
FY 1993 vs. FY 2000

From FY 1993 to FY 2000:

- Relative military pay declined by 14.1%
  - Elasticity of relative military pay 0.70
  - Effect of decline in pay = $14.1 \times 0.70 = 9.9\%$
- Unemployment declined by 43.0 %
  - Elasticity of unemployment rate 0.67
  - Effect of decline in unemployment = $43.0 \times 0.67 = 28.8\%$
- GSMA enlistments declined by 38.7%
  - $38.7 = 14.1 \times 0.70 + 43.0 \times 0.67$
- Because of increases in recruiters, missions, education benefits and bonuses, GSMA enlistments actually declined by 15.9%

Effect of the Economic Boom on GSA Contracts for All Services: FY 1993 vs. FY 2000

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Service	Effect on GSFA's	Effect on GSMA's
Army	-25.7%	-38.7%
Navy	-30.7%	-27.5%
Air Force	-32.5%	-17.3%
Marine Corps	-29.2%	-11.4%

Validation Tests 1 and 2 by Service Percent Errors for Gross Contracts April 2000-March 2001

| Service	Validation Test 1 **Actual Values of Unemployment and Earnings**	Validation Test 2 **Forecasts of Unemployment and Earnings**
Army	-1.59%	-3.05%
Navy	-1.25%	-1.91%
Air Force	-1.20%	-2.83%
Marines	0.17%	-0.71%

Risk Assessment Methodology

- Construct a probability distribution for GSA contracts using 50,000 computer simulations

- Account for uncertainty of
  - GSMA and GSFA models and parameter estimates

  - Unemployment forecasts

- Compare with targets
  - Minimum GSA requirement
  - Mission assigned to recruiters

Risk Analysis for FY 2003

Forecast of GSA Contracts 60,587			
Target		Probability Goal Achieved	Goal Achieved
GSA Requirement	46,436	> 99%	Yes
Recruiters' GSA Mission	52,749	> 99%	Yes

GSA Probability Curve

Recruiters' Mission 52,797
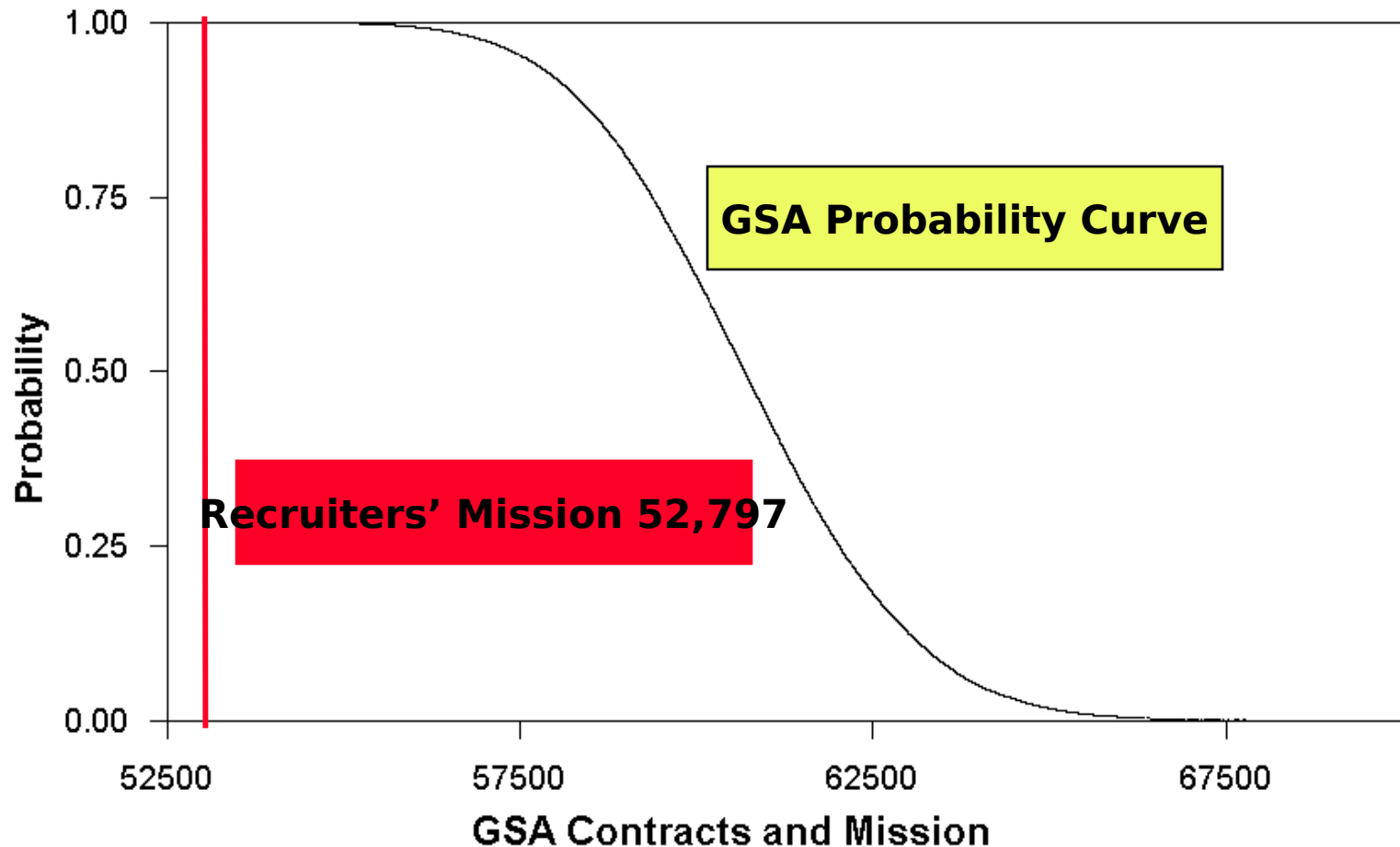
Forecast and Assumptions

Variables	Actual 10/00-9/01	Actual 10/01-9/02	Forecasted 10/02-9/03	%Change 10/02-9/03
GSA Contracts				
GSMA	38,538	47,783	48,389	1.3
GSFA	10,927	12,145	12,198	0.4
GSA	49,465	59,928	60,587	1.1
USAREC GSA Mission				
GSMA	53,565	43,414	36,220	-16.6
GSFA	14,042	12,245	10,216	-16.6
GSA	67,607	55,659	46,436	-16.6
Supply Factors				
Relative Military Pay Males	0.71	0.77	0.78	1.0
Relative Military Pay Females	0.83	0.89	0.90	1.1
Unemployment Rate	4.38	5.71	5.64	-1.3
Recruiters	6,184	6,407	6,232	-2.7
(Army College Fund + MGIB)/ College Cost	0.81	0.82	0.84	2.6
Bonuses(EB+HG+AB)/CPI	31.42	28.38	27.72	-2.3
Advertising/Cost Indexes	2,375	2,728	2,988	9.5
Recruiter's GSA Mission/Recruiter				
GSMA	9.1	7.1	6.6	-7.0
GSFA	2.4	2.0	1.9	-7.0
GSA	11.5	9.1	8.5	-7.0

Summary and Conclusions

- IDA has developed an EEWS for each Service
- Credible
  - Based on valid data and forecasting models
  - Developed by unbiased Federally Funded Research Center
  - Research documented and distributed; not a secret Army "black box"
- Accurate
  - Expect 1-3 percent forecasting error next 12 months
  - Somewhat higher error if the economy changes rapidly
- Timely
  - Monthly reports in 20-25 days for early detection of problems

Recommendations

- Minimize recognition and response lags
  - Update and run the EEWS monthly
  - Distribute EEWS research and monthly reports throughout the government
- Use the EEWS to
  - Prevent accession crises
  - Adjust recruiting resources (up and down)
- Implement *Crisis Prevention Management*
  - Develop management tools to help quickly adjust resources

Back Up Slides

Definitions of Variables

Variable	Definition	Data Source/Period
GSMA	Gross contracts: NPS male, 1–3A, HSDG + HSSR	DMDC; 10/78–9/01
GSFA	Gross contracts: NPS female, 1–3A, HSDG + HSSR	DMDC; 10/92–9/01
Military Pay	$BPY_1 + BPY_2/1.3 + BPY_3/1.3^2 + BPY_4/1.3^4$ where BPY = expected basic pay @ actual TIG Army; 5-month moving average centered on the current month	BPY from OUSD/Comp, 10/78–9/01; TIG from OSD/EPM, 10/78–9/99
Civilian Pay	$CPY_{18} + CPY_{19}/1.3 + CPY_{20}/1.3^2 + CPY_{21}/1.3^4$ where CPY = average annual earnings of HSG's who work full time; by gender; 5-month moving average centered on the current month	Current Population Surveys (monthly Earnings files); from NBER, 1/79–12/99, from CPS/BLS website 1/00–9/01
Relative Military Pay	PV Basic Pay ÷ PV Civilian Pay; by gender	
Unemployment	Unemployment rate total civilian labor force	CPS/BLS; 1/70–9/01
Recruiters	Regular Army production recruiters	USAREC; 10/78–9/01
Advertising	Total Regular Army media placement costs in thousands divided by cost indexes (base = 1983); weighted average over last 6 months, weights = 6/21, 5/21, …,1/21	Advertising data from USAREC, 1/80–9/01; media cost indexes from McKann-Erickson, NYC, 1/79–9/01

Definitions of Variables (continued)

Variable	Definition	Data Source/Period
GSMA Goal	GSMA contract mission per recruiter: GSMA mission until FY 94; GSA mission × Goal for [NPS males/NPS accessions] since FY 1995	Net contract missions from USAREC, 10/80–9/01; % NPS accession male goal from HQDA/DAPE-MPA, 10/94–1/01
Other Goals	Total contract mission minus GSMA (GSFA) mission per recruiter	USAREC; 10/80–9/01
GSFA Goal	GSFA mission per recruiter: GSFA mission for FY 92–94; GSA mission × goal for [NPS females/NPS accessions] since FY 1995	GSA contract missions from USAREC, 10/86–9/01; % NPS female accession goal from HQDA/DAPE-MPA, 10/94–9/01
Bonus	Expected total bonus divided by CPI; sum for all programs X $X = AB, EB, HG,$ and QS, $X = \Sigma_i \Sigma_j \, WMOS_i \times WTOS_j \times \$Bonus,$ $WMOS_i =$ average percent NPS accessions in MOS_i and $WTOS_j =$ average percent NPS accessions in TOS_j	Bonuses by MOS/TOS, MOS and TOS weights, HQDA/DAPE-MPA, 10/79–9/01; CPI from BLS 10/79-9/01
ACF+MGIB	Expected present value of Army total education benefits, @ 30% discount rate, divided by annual cost of college (4-year public institution); MOS/TOS weighted measure similar to expected bonus	ACF by MOS/TOS, MOS and TOS weights, HQDA/DAPE-MPA, 1/79–9/01; cost of college from Dept. of Education 1/78–9/01